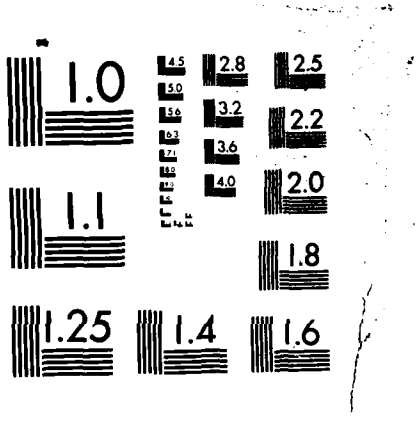
AD-A165 411 IMPROVED DETECTION OF OXYGEN CONSUMPTION NITRATE REDUCTION AND CO(2) EVOL (U) BIGELOW LAB FOR OCEAN SCIENCES WEST BOOTHBAY HARBOR ME T T PACKARD 1985 1/1

UNCLASSIFIED N00014-76-C-0271 F/G 8/10 NL



Improved Detection of Oxygen Consumption, Nitrate Reduction, and CO_2 Evolution in the Deep-Sea

T.T. Packard
Bigelow Laboratory for Ocean Sciences
W. Boothbay Harbor, Maine 04575
(207) 633-2173

N00014-76-C-0371

1985

RESULTS (1983-1984)

Using maps of respiratory electron transport activity in the coastal upwelling areas off Oregon, southern California, and northwest Africa, I have been able to distinguish rising freshly upwelled waters from the waters of a relaxed upwelling event.

Using measurements of ETS activity deep under the Peru Current, and oxygen and current measurements in the basins of the southeastern Pacific Ocean, I have calculated that the 2000 m water has taken 685 years to move from its origin at 70° S latitude to the Peru Basin.

Using ETS activity measurements from the oxygen minimum zone of the western Mediterranean and the Alboran Sea, I have shown that under the Alboran gyre to the east of the Straits of Gibraltar there lies a bolus of water that exhibits enhanced metabolic activity. Measurements of pH, inorganic nutrient salts, and particulate ATP, carbon and nitrogen all confirm the presence of this metabolically active body of water. Collectively, this data is the best and clearest evidence for the biochemical role in the formation of oceanic oxygen minimum zones.

During this year, I participated in one cruise to the Alboran Sea during which I measured the ETS activity and particulate carbon and nitrogen. The results provided additional evidence for the biochemical formation of the oxygen minimum zone in the western Alboran and support the previous conclusions that we arrived at previously from the data from our cruise with the French onboard the R/V Jean Charcot.

In the laboratory, we conducted experiments with respiratory control, with ETS calibration, with fluorometry as a means for detecting ETS activity, and with the use of rapid freezing and low temperature storage to preserve ETS activity. The calibration study and the preservation study were successful and I used them both on the Alboran Sea cruise.

In my efforts to communicate our work, I completed the publication of four papers and one is in press. These manuscripts are listed below.

PUBLICATIONS

Papers in Print

Packard, T.T., C. Joiris, P. Lasserre, H.J. Minas, M. Pamatmat, A.R. Skjoldal, R.E. Ulanowicz, J.H. Vosjan, R.M. Warwick and P.J.leB. Williams. 1984. Respiration. In Flow of energy and materials in marine ecosystems. M.J.R. Fasham (ed.). Plenum Publishing.

Garfield, P.C., T.T. Packard, G.E. Friederich and L.A. Codispoti. 1983. A subsurface particle maximum layer and enhanced microbial activity in the secondary nitrite maximum of the northeastern tropical Pacific Ocean. J. Mar. Res. 41: 747-768.

Packard, T.T. Oxygen consumption in the ocean: Measuring and mapping with enzyme analysis. In Advances in Chemistry, Series 209. Mapping Strategies in Chemical Oceanography. 1985. A. Zirino (ed.).

Packard, T.T., D. Blasco and R.C. Dugdale. Coastal upwelling: A short summary of its physical, chemical, and biological characteristics. In Marine Geology and Oceanography of the Arabian Sea and Coastal Pakistan. B.U. Haq, J.D. Milliman and G.S. Quraishee (eds.) 1984.

Paper in Press

Packard, T.T. Respiratory electron transport activity in marine microplankton. In Advances in Aquatic Microbiology, Vol. 3. P.J.leB. Williams and H. Jannasch (eds.).

DTIC

END

4-86